

Occupational Exposure of Health Care Workers to Airborne Influenza

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Background

Influenza is a contagious respiratory illness caused by an infection of the nose, throat, and lungs with influenza virus. Influenza is transmitted primarily by droplet, airborne and contact transmission.

Health care providers may be the first to come into contact with infected individuals. Recent research has found influenza droplets 1.8 meters from infected patients.

Further testing is needed to determine personal exposure of health care providers and area concentrations of the virus present in health care settings.

Objectives

Assess area concentrations and personal exposure of inhalable aerosols containing influenza virus in health care settings.

Determine if detection of influenza aerosols can be improved using new sampling techniques.

Methods

Patients that tested positive for influenza virus were identified through hospital laboratory Polymerase Chain Reaction diagnostics (e.g., Cycle Threshold). Health care providers caring for these patients were recruited.

Area samples were collected using a NIOSH Biosampler, a Next Generation Inhalable Aerosol Sampler (NGIAS), and an Andersen N6 single stage impactor containing Hanks Balanced Salt Solution. Samples were collected within 1.5 meters of the patient's head.

Personal exposure sampling was conducted using a NIOSH Biosampler and NGIAS attached to the breathing zone of a health care provider during routine patient care.

Both samples were collected for four hours. Total viral particles were determined using qPCR methods.

Results

Six area samples, four personal samples, and two control samples have been collected to date.

Thus far, no influenza virus has been detected in analyzed samples via qPCR.

Influenza Data Collected to Date

Sample	Cycle Threshold of Patient Swab		Distance of Area Sample from Patient, m	Duration of Patient Care, hr	Virus Detection in Air*
	Influenza A	H1N1			
1	28.94	24.05	1.2	4	-
2	ND	24.12	1.3	3	-
3 [†]	ND	24.12	1.5	N/A	-
4 [‡]	33.38	34.85	1.5	2	-
	ND	24.12	N/A	-	-
5	17.78	18.21	1.5	3	ND
6 [‡]	17.78	18.21	1.4	N/A	-
7 [†]	N/A	N/A	1.0	2	-
8 [†]	N/A	N/A	1.0	2	-

* only sample analyzed to date

‡ area sample only, no personal sample collected

† control sample

‡ health care provider was caring for two positive influenza patients when sampled

ND = no detection



Figure 2. Personal Sampling Equipment

Conclusions

Preliminary analysis has indicated that sampling and extraction methods may need to be adjusted to account for low environmental virus concentrations.

Further investigation is recommended to determine area concentration, health care worker exposure, sampler performance, and potential exposure controls in patient care settings.

Future Research

Complete collection of personal (n=25) and area (n=25) influenza aerosol samples.

Continue analyzing collected samples to determine if influenza virus detection was achieved.

Present findings to health care providers and discuss options for controlling occupational exposure to aerosols containing influenza.

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Figure 1. Andersen N6 Single Stage Impactor